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AUTHOR Frankenberger, William
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ABSTRACT

The study was designed to determine whether 16 aggressive mentally retarded adults could reduce their resting electromyographic (EMG) levels through relaxation training techniques. Ss were selected from a large state institution. Ss were divided into two groups--the experimental group received six training sessions which included whole body relaxation training followed by 5 minutes of EMG biofeedback training, and the control group which listened to music for the same amount of time. Following the recording of the first baseline EMG levels, Ss in the experimental condition participated in 5 minutes of whole body relaxation exercise and were asked to observe the investigator modeling the exercise. At the end of muscle relaxation exercises, Ss were asked to remain relaxed and to continue to breathe slowly and deeply. After training, EMG baselines were again recorded. Ss were also instructed in listening to the EMG instrument to monitor the relaxation in their muscles. The control group was attached to the biofeedback equipment but did not receive training or contingent EMG feedback. Results of the study demonstrated that retarded individuals were able to significantly lower their EMG levels as a result of muscle relaxation training. No carryover of training effects was found between sessions. Tables with statistical data are included. (SW)

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Relaxation Training with Aggressive Mentally Retarded Adults: A Failure to Observe Carry-over Effects

William Frankenberger, Ph.D.

Ohio State University

The Nisonger Center

Address:

Psychology Department

University of Wisconsin-Eau Claire

Eau Claire, Wisconsin 54701

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Abstract

Sixteen aggressive institutionalized mentally retarded clients were divided into two groups. One group received muscle relaxation training followed by EMG biofeedback training. The other group acted as a control and received no training. The groups entered the experiment with EMG levels which were not significantly different. Subjects who received relaxation training were able to reduce their EMG levels below initial baseline levels. The significant reduction in EMG levels was not obtained by the control group. Baseline EMG levels for the experimental group were significantly lower following muscle relaxation training, however, subjects were not able to reduce levels below post-relaxation training levels as a result of EMG biofeedback training. Implications and future research ideas were discussed.

Relaxation Training with Aggressive Mentally Retarded Adults: A Failure to Observe Carry-over Effects

The electromyographic (EMG) has become an important response employed in psychophysiological research. It has been used for the following purposes: a) as a measure of the physiological components of human information-processing (Cacioppo and Petty, 1981), b) as an instrument employed to attack arousal theory (Schwartz, 1975), c) in the treatment of clinical problems such as tension headache (Budzynski, Stoyva, and Adler, 1970), anxiety (Raskin, Johnson, and Rondestvedt, 1973), and asthma (Alexandra, 1972), d) as a means for comparing the efficacies of treatment procedures which purport to induce relaxation.

Previous studies have used EMG levels as direct physiological measures of muscle relaxation (Sime and De Good, 1977; Haynes, Mosely, and Mc Gowan, 1975; Reinking and Kohl, 1975). Two relaxation methods currently reported in the literature are muscle relaxation training (Jacobson, 1938) and EMG biofeedback training. The application of both of these procedures for relaxation training have become common with intellectually average individuals (Budzynski et al., 1970; Alexander, 1972; Reeves and Mealiec, 1975, Wolpe, 1958). Recently, muscle relaxation training to induce relaxation has also been attempted in mentally retarded individuals. Peck (1977) incorporated muscle relaxation into a therapeutic program aimed at eliminating the fear of rats and heights in mentally retarded subjects. He found that his mildly and moderately retarded subjects were able to learn the procedures without difficulty. Bott (1979) employed muscle relaxation training as a therapeutic intervention aimed at reducing aggressive behavior within sheltered workshop settings. For her mildly and moderately retarded

subjects, muscle relaxation training resulted in a significant decrease in post treatment incidents of aggression. Harvey (1979) advocated the use of muscle relaxation procedures for the elimination of phobias, reducing general anxiety, facilitating group interaction, and reducing maladaptive behavior in retarded individuals.

EMG biofeedback training has been used extensively for a myriad of purposes with intellectually average individuals and is currently being suggested as a possible treatment for mentally retarded clients. In particular, muscle relaxation training and EMG biofeedback training may be employed to induce relaxation in retarded clients who exhibit anxiety or aggression. However, before these methods are added to the current repertory of behavioral intervention techniques their therapeutic efficacies should be known.

The purpose of this study was to determine whether aggressive mentally retarded subjects could reduce their resting EMG levels via relaxation training techniques. A second purpose was to determine if EMG biofeedback training initiated immediately following muscle relaxation training would result in a lowering of EMG levels below those obtained by progressive muscle relaxation. In at least some studies (Haynes et al., 1975, Reinking and Kohl, 1975) EMG biofeedback has been shown to be more effective than progressive muscle relaxation training. When considering the application of these techniques to retarded clients, ease of implementation is also a consideration. If EMG training is not significantly superior to muscle relaxation training, the latter would be preferable in practice since it does not require the use of electrical devices, attachment of electrodes, nor supervised use of the procedures. A final purpose of the study was to investigate the duration of treatment effects.

Subjects

The subjects were 16 aggressive mentally retarded adults who resided at a large state institution. They were selected from a group of 50 aggressive individuals who were referred for the study, and were identified as highly aggressive by the institution staff. Only subjects who were physically aggressive toward inanimate objects and/or other individuals and had at least one documented incident of aggressive behavior per month for at least three months prior to referral were selected for the study. Subjects with gross visual or auditory impairments were exluded from the study. The age range for the subjects was 17 to 39 with a mean age of 26.7 years and the sample consisted of 11 females and five males. The WAIS IQ levels for the group ranged from 20 to 59 with a mean of 43.9. Subjects had been residents of the institution from one to 24 years with a mean institution age of 12.4 years.

Apparatus

Forearm EMG data were obtained using silver-silver chloride cup sensors 15mm in diameter attached according to the standard forearm extensor placement suggested by Lippold (1967). Before attaching the electrodes the subject's forearm was scrubbed with alcohol and abraded with abrasive pads. Rothex electrode paste was employed as an electrode-skin interface. EMG levels were recorded with a Cyborg J33 EMG instrument. The electrode skin resistance was maintained below 19,000 ohms. Exact EMG level was obtained via visual feedback from the display meter which appears on the front of the J33 unit. The EMG unit was positioned behind the subjects and was shielded from their view by a large wooden panel.

Slide stimuli were manually presented to the subjects using a standard 35mm carousel slide projector and screen. The four foot square screen was positioned 10 feet in front of the subjects.

Experimental Conditions

The 16 aggressive subjects were randomly divided into two groups. There were no significant differences between the groups in IQ, age, sex, or length of institutionalization. The subjects in the experimental group received six training sessions. Each session included five minutes of whole-body relaxation training followed by five minutes of EMG biofeedback training.

The subjects in the control group also attended six sessions. The control group subjects listened to music during the time intervals when the experimental subjects received muscle relaxation and biofeedback training.

Procedures

The study was carried out in a quiet, light attenuated room. Each training session lasted 22 minutes and 45 seconds. Subjects were individually escorted to and from their units to the testing room where they were seated in a reclining chair. Electrodes were then placed on the subjects' forearms and a three minute adaptation period began. At the end of the adaptation period, baseline EMG levels were visually recorded from the display meter on the front of the J33 muscle trainer. Recordings of baseline EMG levels were obtained at five second intervals for a period of 15 seconds. Thirty seconds after the first group of EMG levels was obtained, the second series of baseline levels were recorded. Recording of baseline EMG levels continued on this schedule until five separate groups of four recordings had been obtained. During the adaptation and baseline EMG recording periods, the subjects were exposed to nonarousing slide

stimuli at the rate of one slide every 15 seconds. Eighty different color slides were utilized during the study to entertain the subjects while EMG readings were being recorded.

Following the recording of the first baseline EMG levels, subjects in the muscle relaxation/biofeedback training condition participated in 5 minutes of whole-body relaxation exercises which consisted of deep breathing and alternately tensing and relaxing various large muscle groups. The investigator was seated in front of the subjects. The subjects were first asked to observe the investigator modeling the exercises. During the remainder of the training period, the investigator performed the procedures along with the subjects.

At the end of the muscle relaxation exercises, the subjects were asked to remain relaxed and to continue to breathe slowly and deeply. The subjects were again shown slides at fifteen second intervals. At the end of three minutes of post muscle relaxation, EMG baselines were again recorded. These levels were recorded in the same manner as was described for the initial baseline period.

After the post-muscle relaxation baseline was recorded, the subjects were instructed to avoid moving and relax as much as possible. They were informed that to help them relax their muscles, they would hear a series of clicks from the EMG instrument. The subjects were told and shown that the speed of the clicks indicated whether or not they were relaxed. After the subjects had learned to discriminate tense from relaxed muscles, as related to the speed of the clicks, the subjects were instructed to attempt to make the clicks go as slow as possible and to attempt to make the clicks stop entirely. The EMG biofeedback session continued for five minutes. At the end of five minutes the subjects were asked to avoid movement and remain

relaxed. At this time post biofeedback EMG baseline levels were recorded in the presence of the slides and in the same manner as in the other baselines.

The no muscle relaxation/no biofeedback control group was attached to the biofeedback equipment but did not receive muscle relaxation training or contingent EMG feedback. These subjects were exposed to the same instructions, procedures and slides as the experimental group and baseline EMG levels were recorded in the same manner. During the time intervals when the experimental group received muscle relaxation and EMG biofeedback training, this group listened to a total of 10 minutes of music consisting of the songs of a popular female vocalist.

Training for both groups continued for four consecutive weeks with each subject receiving six training sessions over the four week interval. The subjects were seen twice weekly for the first two weeks, and once weekly thereafter.

Results

During the course of the study, one subject in the control group refused to attend any further sessions. All other subjects in both groups attended all six training sessions.

Table 1 presents experimental and control group mean EMG baselines for each of the six training sessions. The group variance for the control group was consistently greater than that of the experimental group. Individual data indicated that certain of the Ss in the control group relaxed to some extent during the periods of recorded music, while other subjects actually increased EMG levels. Individuals in the experimental groups characteristically lowered their EMG levels during each session.

Insert Table 1

It is apparent from the examination of Table 1 that aside from the effect of the large group variance, the baseline EMG levels for the experimental group were more frequently lower than the baselines for the control group. The nonparametric median test was used to determine whether the experimental and control group differences exceeded chance levels. The differences between baseline one EMG levels for the two groups were not significant ($p>.05$). For baselines two and three, the experimental group showed significantly lower EMG levels than the control group ($p>.05$). The baseline EMG levels for both groups were presented in figure 1.

Insert Figure 1 here

To further insure that the experimental and control groups were equal in resting EMG levels before experimental manipulations were instituted, a Student *t*-test was performed comparing the experimental and control group mean EMG levels on the first baseline obtained during session one. The *t*-value obtained for this comparison was $t = .07$. This value was below the level needed for significance ($p>.05$).

After determining the initial equality of the two groups for baseline EMG levels, the experimental and control groups were analyzed separately and differences in baseline EMG levels across all six sessions were tested for both groups. A repeated measures analysis of variance was computed to determine the significance of the differences among the three baseline measures for the experimental group and control group separately. The F value obtained for the experimental group was significant ($p>.01$). The F value computed for the control group was not significant.

The two groups were separately analyzed for session effects. The F value testing session effect for the experimental group was not significant ($p>.05$). Thus, it may be concluded that there was not a significant change in EMG levels due to the subjects' exposure to more training.

Discussion

Aggressive Ss were selected for this study because they would be among those most likely to be included in intervention programs. In addition, if aggressive Ss were able to perform the necessary relaxation procedures, the procedures could presumably be used for less severely disturbed Ss.

The results of the study demonstrated that retarded individuals were able to significantly lower their EMG levels as a result of muscle relaxation training. The data indicated that although both the experimental and control groups entered training with similar EMG levels, the experimental group was able to relax (as measured by EMG change) more effectively than the control group.

As noted in Table 1, the EMG biofeedback condition did not significantly lower EMG levels below those obtained following muscle relaxation training. However, even though the possibility of a floor effect exists in the design employed, the added expense and time consuming procedures associated with EMG biofeedback training may not be necessary to induce relaxation in retarded individuals. These results are similar to those of Reed and Laslow (1980) who found that muscle relaxation training was as effective as EMG training at reducing forehead EMG and self-reported test anxiety in intellectually average Ss.

The results of the study indicated that the EMG may be used to evaluate the efficacy of related treatment programs which have been employed in the

field of mental retardation. In addition, the study showed that muscle relaxation training can be effectively taught to moderately and severely retarded individuals with severe levels of maladaptive behavior.

Burish and Schwartz (1978) found that intellectually average subjects who had previous EMG biofeedback training showed lower EMG levels on post-tests than subjects who had no previous training. Harvey and Berry (1979) found that for their mildly retarded subjects, biofeedback produced reductions in frontalis EMG levels four weeks after training had been discontinued. Although Bott did not record EMG levels, she found a reduced incidence of aggressive behavior for her workshop clients who regularly employed muscle relaxation exercises. The above findings indicate that there may be a carry-over effect for both EMG biofeedback and muscle relaxation training.

The present study found no carry-over of training effects between sessions. The discrepant findings may be a result of differences in subject populations, with more severely mentally retarded subjects showing less carry-over. Differences in training schedules may also account for the discrepancies. Harvey and Berry (1979) conducted 20 sessions within a period of four weeks while the present study exposed each subject to six sessions during a four week period of time.

The results of the study point out the possible applications of muscle relaxation training as a method to induce relaxation in moderately and severely retarded individuals with severe levels of maladaptive behavior. This population has characteristically been resistive to intervention strategies. The evidence gained from this study suggests that techniques involving physiological self-control may be added to the list of treatment programs already employed with the mentally retarded population. Learned

methods of stress control could be especially important to mentally retarded subjects because they may experience more anxiety and have fewer coping skills than intellectually average Ss (Bialer, 1970).

Further research suggested by the present study would be studies designed to investigate the relationship between physiological measures of relaxation, arousal and overt behavior. Before muscle relaxation or EMG biofeedback procedures are employed as behavioral interventions, their efficacies for modifying behavior should be established. Further studies may also evaluate the relative efficacies of muscle relaxation and EMG biofeedback training as therapeutic interventions for mentally retarded individuals, employing controlled or counterbalanced designs.

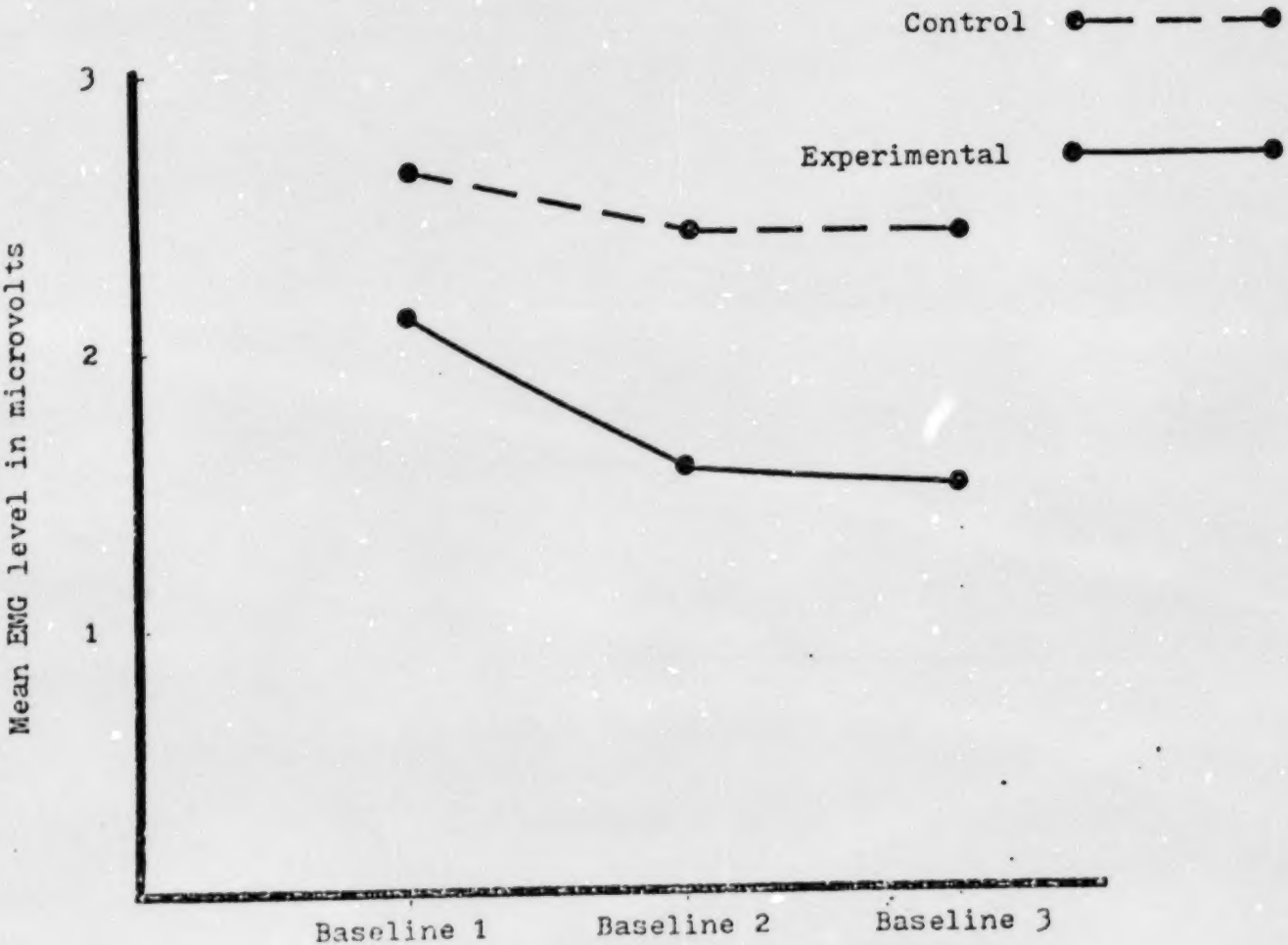
TABLE 1

GROUP MEAN EMG BASELINE LEVELS FOR EACH TRAINING SESSION ON:

BASELINE 1 (POST ADAPTATION)
BASELINE 2 (POST MUSCLE RELAXATION)
BASELINE 3 (POST EMG FEEDBACK)

		Experimental		Control	
			SD		SD
Session 1	Baseline 1	2.33	1.38	2.40	2.65
	Baseline 2	1.54	.74	2.83	3.68
	Baseline 3	1.55	1.16	2.81	3.09
Session Mean		1.81	1.09	2.68	3.14
Session 2	Baseline 1	2.19	1.11	3.00	3.80
	Baseline 2	1.65	.68	2.68	3.06
	Baseline 3	1.53	.63	2.66	3.34
Session Mean		1.79	.80	2.78	3.40
Session 3	Baseline 1	1.75	1.12	2.99	3.86
	Baseline 2	1.31	.86	2.61	3.54
	Baseline 3	1.41	1.08	2.57	2.40
Session Mean		1.49	1.02	2.72	3.27
Session 4	Baseline 1	2.10	1.14	3.11	3.38
	Baseline 2	1.61	1.02	2.18	2.84
	Baseline 3	1.43	.72	2.29	2.80
Session Mean		1.71	.96	2.53	3.00
Session 5	Baseline 1	1.95	1.05	2.04	2.30
	Baseline 2	1.63	.97	2.02	2.22
	Baseline 3	1.52	.97	2.49	2.77
Session Mean		1.70	1.00	2.18	2.43
Session 6	Baseline 1	2.29	1.75	2.20	2.60
	Baseline 2	1.53	1.06	2.07	2.44
	Baseline 3	1.45	.97	1.60	1.43
Session Mean		1.76	1.26	1.96	2.16

Figure 1. Mean EMG levels in microvolts for the experimental and control groups, on Baseline 1 (post adaptation), Baseline 2 (post muscle relaxation), and Baseline 3 (post EMG feedback).


Control
Experimental
3
2
1
Mean EMG level in microvolts
Baseline 1
Baseline 2
Baseline 3

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